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(REV 11-98)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

09/600879

INTERNATIONAL APPLICATION NO.  
PCT/EP99/00883INTERNATIONAL FILING DATE  
11 February 1999PRIORITY DATE CLAIMED  
12 February 1998

## TITLE OF INVENTION

, DEVICE FOR LOADING SUBSTRATES INTO AND UNLOADING THEM FROM A CLEAN ROOM

## APPLICANT(S) FOR DO/EO/US

SCHMUTZ, Wolfgang &amp; GENTISCHER, Josef

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
  2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
  3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
  4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
  5. ☐ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
    - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
    - b. ☐ has been transmitted by the International Bureau.
    - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
  6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
  7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
    - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
    - b. ☐ have been transmitted by the International Bureau.
    - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
    - d. ☐ have not been made and will not be made.
  8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
  9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
  10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).
- Items 11. to 16. below concern document(s) or information included:
11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
  12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
  13. ☒ A **FIRST** preliminary amendment.  
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
  14. ☐ A substitute specification.
  15. ☐ A change of power of attorney and/or address letter.
  16. ☒ Other items or information:
    - Published International Application WO 99/41771
    - English Translation of Published International Application WO 99/41771
    - International Preliminary Examination Report
    - English Translation of International Preliminary Examination Report
    - Executed Small Entity Statement

APPLICATION NO. (if known, see 37 CFR 1.53) <b>09/600879</b>		INTERNATIONAL APPLICATION NO. PCT/EP99/00883		ATTORNEY'S DOCKET NUMBER	
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17. <input checked="" type="checkbox"/> The following fees are submitted: <b>BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):</b> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO. .... \$970.00  International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... \$840.00  International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$760.00  International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... \$670.00  International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) ..... \$96.00  <b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>	<b>CALCULATIONS</b> PTO USE ONLY		
<b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>	\$ 840		
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).			
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	21 - 20 =	1	X \$18.00
Independent claims	1 - 3 =		X \$78.00
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$260.00
<b>TOTAL OF ABOVE CALCULATIONS =</b>			\$ 858
Reduction of 1/2 for filing by small entity, if applicable. A Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).			\$ 429
<b>SUBTOTAL =</b>			\$ 429
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).			\$
<b>TOTAL NATIONAL FEE =</b>			\$ 429
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property			+ \$ 40
<b>TOTAL FEES ENCLOSED =</b>			\$ 469
			Amount to be: refunded
			charged

a. ☒ A check in the amount of \$ 469 to cover the above fees is enclosed. (Check No. 15038)


b. ☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_ to cover the above fees.  
A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any  
overpayment to Deposit Account No. 10-1213. A duplicate copy of this sheet is enclosed.

**NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.**

SEND ALL CORRESPONDENCE TO:  Felix J. D'Ambrosio JONES, TULLAR & COOPER, P.C. P.O. Box 2266 Eads Station Arlington, VA 22202	Date: <u>14 August 2000</u>  <div style="text-align: center;">           SIGNATURE: _____          Felix J. D'Ambrosio          NAME  <u>25,721</u>          REGISTRATION NUMBER       </div>
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017037

Applicant or Patentee: Wolfgang SCHMUTZ and Josef GENTISCHER

Application or Patent No. : \_\_\_\_\_

Filed or Issued: \_\_\_\_\_

For: DEVICE FOR LOADING SUBSTRATES INTO AND UNLOADING THEM FROM  
A CLEAN ROOM

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY  
STATUS (37 CFR 1.9(f) and 1.27(c)) - SMALL BUSINESS CONCERN

I hereby declare that I am

\_\_\_\_\_ the owner of the small business concern identified below:

☒ an official of the small business concern empowered to act on behalf of the concern  
identified below

NAME OF CONCERN ACR Automation in Cleanroom GmbH

ADDRESS OF CONCERN Villinger Str. 2-4, 78078 Niedereschach, Germany

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third-party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed, to and remain with the small business concern identified above with regard to the invention, entitled DEVICE FOR LOADING SUBSTRATES INTO AND UNLOADING THEM FROM A CLEAN ROOM by inventor(s) Wolfgang SCHMUTZ and Josef GENTISCHER described in

☒ the specification filed herewith

\_\_\_\_\_ application no. \_\_\_\_\_, filed \_\_\_\_\_

\_\_\_\_\_ patent no. \_\_\_\_\_, issued \_\_\_\_\_

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below\* and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

\*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27).

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_

\_\_\_\_ INDIVIDUAL \_\_\_\_ SMALL BUSINESS CONCERN \_\_\_\_ NONPROFIT ORGANIZATION

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_

\_\_\_\_ INDIVIDUAL \_\_\_\_ SMALL BUSINESS CONCERN \_\_\_\_ NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small business entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING X Josef Gentischer  
TITLE OF PERSON OTHER THAN OWNER X Dipl. Ing.  
ADDRESS OF PERSON SIGNING \_\_\_\_\_

**ACR //**

Automation in Cleanroom GmbH  
Villinger Strasse 4, D-78078 Niedereschach  
Tel. 0 77 28 - 92 60-0, Fax 0 77 28 - 92 60-40

ppa.  
SIGNATURE Josef Gentischer Date X 31.07.2000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of )  
 )  
Wolfgang Schmutz et al )  
 )  
Appln. No. : TBA )  
 )  
Filed : August 14, 2000 )  
 )  
For : DEVICE FOR LOADING SUBSTRATES )  
 INTO AND UNLOADING THEM FROM A )  
 CLEAN ROOM )

**PRELIMINARY AMENDMENT**

Honorable Commissioner of Patents and Trademarks  
Washington, D.C. 20231

Sir:

Prior to an examination on the merits, please amend this application as follows:

**AMENDMENTS**

**IN THE SPECIFICATION:**

Page 1, line 3, change "Specification" to

--Field of the Invention--;

line 5, change "in accordance with" to --having a lock device, on which a  
transport box can be brought for receiving the substrates and which is provided with a  
hermetically sealed opening, and which has a processing installation adjoining the locking  
opening--;

lin 6, delete "the preamble of claim 1";

between lines 6 and 7, insert

--Background of the Invention--;

line 9, change "the" (first occurrence) to --a--;

line 11, change "the" (first occurrence) to --a--;

line 12, change "in" to --with--;

line 16, change "reasons" to --reason--;

line 17, change "in" to --with--;

between lines 18 and 19, insert

--Summary of the Invention--;

line 20, change "create" to --provide--; and

line 22, change "in" to --with--.

Page 2, line 1, delete ", the characteristics recited in claim";

line 2, delete "1 are provided";

line 3, between "outset" and the "." insert --, an adapter device is provided  
which is arranged between the processing installation and the lock device, on which the lock  
device can be releasably fastened and which is held on the processing installation and can be  
adjustably oriented with respect thereto--;

line 5, between "the" and "invention" insert --present--;

line 6, change "in" to --with--;

line 12, delete "by means of the";

line 13, delete "characteristics of claim 2";

line 14, change "in" to --with--, and change "the" (second occurrence) to

--a--;

line 17, delete in its entirety;

line 18, indent as a new paragraph, and change "for" (first occurrence) to --For--;

line 19, between "axis" and the "." insert --the underside of the adapter device is connected with two spaced apart, height-adjustable forcing screws which are held on a stationary element--;

line 21, change "means of the characteristics" to --the provision of adjustable forcing screws which are supported on a component of the processing installation--;

line 22, delete "in accordance with claim 4";

line 23, delete in its entirety;

line 24, indent as a new paragraph, change "for" to --For--, and between "setting" and the "." insert --fastening screws are provided which pass through bores of larger diameter--; and

line 27, change "the characteristics in accordance with claim 7" to --spaced apart indexing pins, which can be fittingly and essentially free of play plugged into receiving bores of the lock device--.

Page 3, line 1, after "the" (second occurrence) insert --fact that the lock device has a base plate which has a bore pattern corresponding to the arrangement of the indexing pins in the adapter device--;

line 2, delete "characteristics in accordance with claim 8";

line 3, delete ", the characteristics in accordance";

line 4, delete "with claim 9 are provided,", and change make" to --makes--;

line 7, between "opening" and the "." insert --, a roller track is provided in the area of the receiving table--, and change "this the characteristics in" to --pivoting the roller track, preferably  $\pm 90^\circ$  and providing vertically upward extending lateral insertion slopes;

line 8, delete "accordance with claim 10 and/or 11 are provided";

line 12, delete "the characteristics in";

line 13, change "accordance with claim 12" to --inclining the roller track slightly in the direction toward the processing installation, or toward a loading and unloading level--;

line 15, change "in accordance with the characteristics of claim 13" to --to have two parallel track elements connected by a loop and extending on both sides of the receiving table--;

line 16, delete "the" (second occurrence);

line 17, change "characteristics of one or several of claims 14 to 16" to --connecting the connecting loop to a lever whose other end is pivotably maintained on a vertical shaft, with the lever or pivot shaft being displaceable in height--;

line 19, delete "the characteristics";

line 20, change "of claim 17" to --the provision of a lock door which can be connected with a cover--;

line 22, delete "when the characteristics in accordance with";

line 23, change "claim 18 and/or 19 are present" to --by the provision of a clutch disk connected with a parallelogram device, which is moved by a motor-driven worm-gear. The parallelogram drive has a hinged connecting rod from which a manual lever projects, and



which is accessible from the outside--;

line 25, change "if the characteristics in accordance with claim 20" to  
--from the closing movement of the lock door, the displacement movement of the receiving table  
and the lowering movement of the receiving table and the lowering movement of the roller track  
are derived from a similar crank drive, with the drive for these movements arranged inside the  
lock device--;

line 26, delete "and/or 21 are provided";

line 27, between "the" and "invention" insert --present--; and

line 28, between "the" and "invention" insert --present--.

Page 4, line 2, delete "Shown are in:";

between lines 2 and 3, insert

--Brief Description of the Drawings--;

line 3, between the "," and "a" insert --is--;

line 7, between the "," and "a" insert --is--;

line 9, between the "," and "a" insert --is--;

line 11, between the "," and "a" insert --is--;

line 13, between the "," and "a" insert --is--;

between lines 13 and 14, insert

--Description of the Preferred Embodiments--; and

line 24, change "in" to --with--.

Page 6, line 4, change "in" to --with--;

line 7, change "in" to --with--;

line 11, change "in" to --with--;

line 14, change "in" to --with--; and

line 29, change "in" to --with--.

Page 8, line 9, change "in" to --with--.

Page 12, line 8, change "bush" to --bushing--; and

line 13, change "bush" to --bushing--.

Page 14, line 1, change "in" to --with--.

IN THE CLAIMS:

Please cancel claims 1-21 without prejudice or disclaimer of the subject matter thereof.

Please add the following new claims:

22. A device for loading or unloading substrates into or out of a clean room, comprising:

a lock device provided with a hermetically sealable lock opening;

a transport box for receiving substrates, said transport box being received on said lock device;

a processing installation adjoining said lock opening; and

an adapter device arranged between said processing installation and said lock device, and being held on said processing installation and adjustably oriented relative thereto, said lock device being releasably fastened on said adapter device.

23. The device as defined in claim 22, wherein said adapter device includes means for adjusting said adapter device according to one of: in height with respect to said processing

installation, in inclination with respect to a vertical axis defined by the device, in inclination with respect to a horizontal axis defined by the device, and in displacement relative to at least one of: said vertical axis and said horizontal axis.

24. The device as defined in claim 22, wherein said processing installation includes a stationary element, and wherein said adapter device has an underside with two spaced apart, height-adjustable forcing screws which are held on said stationary element.

25. The device as defined in claim 24, wherein said adapter device is seated and displaceable according to at least one of: longitudinally and transversely, on said stationary element.

26. The device as defined in claim 22, wherein said adapter device is provided with a plurality of adjustable forcing screws which engage said processing installation.

27. The device as defined in claim 22, further comprising:

fastening screws for fixing in place said adapter device relative to said processing device, and wherein said adapter device includes bores through which a respective one of said fastening screws passes, said bores having a diameter which is larger than that of said fastening screws.

28. The device as defined in claim 22, wherein said lock device has a plurality of receiving bores, and wherein said adapter device includes spaced apart indexing pins which are fittingly and essentially free of play plugged into a respective one of said receiving bores.

29. The device as defined in claim 28, wherein said lock device includes a base plate which has a bore pattern corresponding to the arrangement of said indexing pins.

30. The device as defined in claim 22, wherein said lock device has a displaceable

receiving table for said transport box, and a roller track in the area of said receiving table.

31. The device as defined in claim 30, wherein said roller track is pivotable by preferably  $\pm 90^\circ$  around a vertical axis defined by the device.

32. The device as defined in claim 30, wherein said roller track is provided with vertically upwardly extending lateral insertion slopes.

33. The device as defined in claim 30, wherein said roller track has a stop, and is slightly inclined in the direction toward one of: said processing installation and a loading and unloading level.

34. The device as defined in claim 30, wherein said roller track includes two parallel track elements which extend on both sides of said receiving table, and a connecting hoop which connects said track elements.

35. The device as defined in claim 34, wherein said roller track further includes a lever and a vertical shaft, and wherein said connecting hoop is connected with said lever, whose other end is pivotably maintained on said vertical shaft.

36. The device as defined in claim 35, wherein one of: said lever and said pivot shaft, are displaceable in height.

37. The device as defined in claim 30, wherein said roller track can be raised and lowered with respect to said receiving table.

38. The device as defined in claim 22, further comprising:

a lock door including a cover for said transport box, wherein said cover is provided with two T-shaped keys, which can be rotated by means of a parallelogram drive

maintained in said lock door, and wherein said lock opening is hermetically sealed by means of said lock door, said lock door being connected to said cover.

39. The device as defined in claim 38, further comprising:

a clutch disk; and

a motor-driven worm gear, wherein said clutch disk is connected with said parallelogram drive, and wherein said parallelogram drive is moved by said motor-driven worm gear.

40. The device as defined in claim 38, wherein said parallelogram drive has a hinged connecting rod from which a manual lever projects, said manual lever being accessible from the outside of the device.

41. The device as defined in claim 22, further comprising:

a lock door, wherein said lock device includes a roller track, and wherein closing movement of said lock door, displacement movement of said receiving table, and lowering movement of said roller track are derived from a similar crank drive.

42. The device as defined in claim 41, wherein the drive mechanism for the closing movement of said lock door, the displacement movement of said receiving table, and the lowering movement of said roller track and said lock door are arranged inside said lock device.

#### REMARKS

The above amendments are intended to place this application in better condition for examination.

Submitted herewith is page 16 of the application containing an abstract of the disclosure.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Felix J. D'Ambrosio', written in a cursive style.

Felix J. D'Ambrosio

Reg. No. 25,721

August 14, 2000

JONES, TULLAR & COOPER, P.C.  
P.O. Box 2266 Eads Station  
Arlington, VA 22202  
(703) 415-1500

## Abstract of Disclosure

The invention relates to a device for loading substrates into and unloading them from a clean room, comprising a lock device onto which a transport box for receiving the substrates can be placed and which is fitted with a hermetically sealing lock opening, and a process unit adjacent to the lock opening. To allow for a valid adjustment of the lock device in relation to the process unit even when the lock device is exchanged, the invention provides for an adapter device to be positioned between the process unit and the lock device to which the lock device can be removably fixed and which is maintained at the level of the process unit and can be adjustably aligned in relation to same.

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Title: Device for Loading Substrates into and Unloading Them from  
a Clean Room

### Specification

The present invention relates to a device for loading and unloading substrates into or from a clean room in accordance with the preamble of claim 1.

With known devices of this type, the processing installation has a manipulating device, by means of which the substrates can be brought from the transport box into the processing installation or vice versa, when the transport box is docked at the lock opening. The exact position of the transport box in respect to the manipulating device, and therefore the processing installation, is important here. This orientation is performed once in a relatively extensive manner during the installation of the device. If now the lock device must be exchanged for whatever reasons, another elaborate adjustment of the exchanged lock device in respect to the processing installation is necessary.

It is therefore the object of the present invention to create a device for loading and unloading substrates into or from a clean room of the type mentioned at the outset, wherein an adjustment of the lock device in respect to the processing installation, which is still applicable in case of an exchange of the lock device, is possible.

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To attain this object, the characteristics recited in claim 1 are provided in a device for loading and unloading substrates into or from a clean room of the type mentioned at the outset.

It can be achieved by means of the measures in accordance with the invention that the frame-like adapter device needs to be oriented or adjusted in respect to the position of the processing device or its manipulating device only once, since then this adapter device always remains and is used as a once adjusted receiver for the lock device. This saves considerable outlay in work and time in case the lock device needs to be exchanged for another one, for example following an error indication.

It is achieved in an advantageous manner by means of the characteristics of claim 2 that the adapter device can be adjusted in respect to the processing device in the desired direction, or in practically all conceivable ones, i.e. placed vertically or horizontally, for example.

The characteristics in accordance with claim 3 are provided for setting the adapter device in the Z-direction, or for tilting it around the X-axis.

A setting around the Y-axis, in the direction of the X- and Y-axis, or the like, is achieved by means of the characteristics in accordance with claim 4.

The characteristics in accordance with claim 6 are provided for the appropriate fixation of the setting.

The connection of the respective lock device with the adapter device is achieved in a quick and simple manner by means of the characteristics in accordance with claim 7. A simple

exchangeability of the lock device results from the characteristics in accordance with claim 8.

In a further embodiment, the characteristics in accordance with claim 9 are provided, which make possible a quick and simple pre-positioned placement of a transport box on the receiving table, which is displaceable, i.e. it can be docked at the lock opening. If in the course of this the characteristics in accordance with claim 10 and/or 11 are provided, the transport box can be brought in a simple manner on the roller track from two or three lateral directions, as well as from above, and therefore on the receiving table. A defined holding position of the transport box on the roller track results from the characteristics in accordance with claim 12.

It is structurally useful if the roller track is embodied in accordance with the characteristics of claim 13. Useful further embodiments of the roller track therefore result from the characteristics of one or several of claims 14 to 16.

In a further embodiment of the present invention, an advantageous construction in accordance with the characteristics of claim 17 is provided for the ability of hermetically sealing the lock opening by means of the lock door. Constructive embodiments ensue when the characteristics in accordance with claim 18 and/or 19 are present.

Advantages in regard to constructive and technical labor outlay result if the characteristics in accordance with claim 20 and/or 21 are provided.

Further details of the invention can be taken from the following description, in which the invention is described in

greater detail and explained by means of the exemplary embodiment represented in the drawings. Shown are in:

Fig. 1, a lateral view in partial section of a device for loading and unloading substrates into or from a clean room in accordance with a preferred exemplary embodiment of the present invention,

Fig. 2, a plan view along the line II - II in Fig. 1 in a partial broken representation,

Fig. 3, a plan view in partial section in accordance with the arrow III in Fig. 1,

Fig. 4, a view from above in accordance with the arrow IV in Fig. 1, but without the transport box, and

Fig. 5, a section along the line V - V in Fig. 1.

In accordance with Figs. 1 and 2, the device 10 for loading and unloading substrates 11 into or from a clean room 12 has a lock device 14, which holds or receives a transport box 13 with the substrates 11, for transferring or receiving the substrates 11 to or from a processing installation 16, which forms the clean room 12 and has, in a manner not represented, a manipulating device for receiving or transferring the substrates 11 from or to the transport box 13.

The device 10 has an adapter device 20, which is arranged between the lock device 14 and the processing installation 16, for the vertical and horizontal adjustment of the lock device 14 in respect to the processing installation 16, independently of their possibly not exactly vertically and/or horizontally aligned positions. The adapter device 20 has a base plate 25, which is provided with an upper opening 24 and a lower opening 23. The base plate 25 rests adjustably on a strip 26, which is fixed in place and here is a part of the processing installation 16, and on

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which two vertical forcing screws 27, which are provided with spherical rollers 22, are supported and are held at a distance

from an angle element 21 of the base plate, and can be vertically screwed in or out. The base plate 25 can be displaced on the strip 26 in the horizontal X-direction, as well as in the Y-direction, which extends transversely in respect to it. By means of the displaceability of each one of the forcing screws 27, the base plate 25 can also be moved in the vertical Z-direction and can be inclined in respect to it. In an upper and a lower area 22 and 23, the base plate 25 is provided with forcing screws 29, which are arranged at a distance and can be screwed in or out and in the mounted state are supported on a surface of the processing installation 16. An alignment of the base plate 25 in respect to the processing installation 16 can take place by adjusting each one of the forcing screws 29, wherein a pivot movement of the base plate 25 in respect to the X- and/or the Y-axes is possible.

The base plate 25 has bores 33 of large diameter near the forcing screws 29, through which fastening screws 34 of smaller diameter pass, which can be screwed into threaded bores 36 of an adjoining part of the processing installation 16, and whose head is supported on a washer 37 (Fig. 4). Because of this, an adjustment, for example in the mm range, is possible, and the position of the adapter device 20, which is adjusted in respect to the processing installation 16, can be fixed in place.

Here, the base plate 25 of the adapter device 20 is equipped with indexing pins 32 and threaded bores 42, for example four. A vertical base plate 40 of the lock device 14 has bores 41 in a corresponding bore pattern for the essentially play-free receipt of the indexing pins 32 and screws 35 for screwing into the threaded bore 42.

Because of the adjustment of the adapter device 20 in respect to the processing installation 16, and the releasably

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pluggable connection with the lock device 14, it is possible without any further adjustment measures to replace the lock device

14 with another lock device, which is provided with the same bore pattern on its base plate 40. Here, the base plate 40 and the base plate 25 lie flat against each other.

In accordance with Fig. 1, the lock device 14 has a housing 43, whose front is closed off by the base plate 40, which extends past the top of the housing 43. The upper cover of the housing 43 is formed by a support plate 44, above which a receiving table 45 for the transport box 13 is held. In a manner still to be described, the receiving table 45 can be moved back and forth in respect to the vertical base plate 40 and can be docked against the latter with the transport box 13.

The base plate 40 has a lock window 46, which is aligned with the coaxial opening 24 of the base plate 25, both of which can be closed by means of a lock door 47. The transport box 13 has an opening 48 coaxially with the lock window 46, which can be hermetically sealed by means of a cover 49. The transport box 13 is displaced toward the base plate 40 for receiving or transferring the substrates 11 from or to the transport box 13. In a manner yet to be described, the cover 49 is unlocked from the transport box 13 with the aid of the lock door 47, is removed and connected with the lock door 47. Once the lock door 47 with the cover 49 is moved out of the area of the lock window 46, the substrates 11 can be removed from the transport box 13 with the aid of the manipulation device, not represented, and brought to the processing installation 16 (into the clean room 12), or vice versa. It is understood that, following the loading of the transport box 13, the cover 49 is connected with the transport box 13 in a correspondingly reverse manner for the hermetic sealing of the opening 48 of the latter, and is unlocked from the lock door 47 and removed.

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All drive and transfer elements necessary for the movement of the receiving table 45 and the lock door 47 are arranged inside



the housing 43 of the lock device 14. A gear motor, not represented, is flanged to the underside or inside of the support plate 44 and is connected via a crank gear 52 with the receiving table 45 for moving the latter horizontally back and forth. For this purpose the crank gear 52 has a crank roller, which engages a lower circular groove of the receiving table 45, so that the receiving table 45 can be moved along rails.

A threaded spindle 57 is seated in the support plate 44, which extends vertically downward and can be driven at its bottom by a gear motor 58. A carriage housing 59 can be moved up and down along the threaded spindle 57 via a nut 61. The carriage housing 59, open toward the base plate 40, receives the horizontal portion of an L-shaped arm 62, on whose vertical arm end the lock door 47 is fastened. Facing away from the nut 61, the carriage housing 59 has a carriage 63, which is guided, vertically displaceable, along a vertical guide 64, which is held on the base plate 40. The end of the horizontal portion of the L-shaped arm 62, which passes through the opening 23 of the base plate 25 and an opening 39 of the base plate 40, is embodied as a carriage 65, which is guided, horizontally displaceable back and forth, on a horizontal guide 66 of the carriage housing 59. The horizontal displacement of the L-shaped arm 62 takes place by means of a gear motor 67 flanged to the carriage housing 59, which drives a crank gear 68, whose crank roller loosely engages a circular groove of the carriage portion 65 of the L-shaped arm 62. In this way the lock door 47 is horizontally moved toward and away from the lock window 46 or the opening 24 with the aid of the gear motor 67, while the L-shaped arm 62, and therefore the lock door 47, can be moved with the aid of the gear motor 58 in the vertical direction out of or into the area of the lock window 46.

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In accordance with Figs. 1, 3 and 4, the lock device 14 has a roller track 75 in the area of the receiving table 45, which has

parallel roller strips 77 equipped with rollers 76 on both longitudinal sides of the receiving table 45. The two roller strips 77 are rigidly connected with each other by means of an arched U-shaped rail 78. In a center area between the two roller strips 77, the U-shaped rail 78 is fixedly connected with the upper end of an angular lever 79, whose vertical portion is conducted through the support plate 44, and whose lower horizontal return portion supports a bearing bush 81 on its free end, through which a vertical shaft 82 is passed. The support plate 44 is provided with a semicircular recess 83, which the lever 79 penetrates and whose radius corresponds to the pivot radius of the lever 79 around the shaft 82. The shaft 82 receiving the bearing bush 81 is guided up and down in the vertical direction on a stationary guide 84. The pivot movement and the vertical up and down movement of the lever 79 are performed, partially not represented, by means of a motor. The lifting motion of the roller track 75 is for example provided by the already mentioned arrangement of the gear motor 71 and the crank gear 72. By means of the pivot movement of the lever 79 around the shaft 82, the roller track 75 can be brought out of a position oriented toward the base plate 40 or the lock window 46 into a position moved in one or the other pivot direction by 90°. In this way a transport box 13 can be brought horizontally on the roller track 75 from three directions, which are located vertically in respect to each other, or any arbitrary positions between these. The roller strips 77 of the roller track 75 have vertically upward extending insertion slopes 86, for example in each of two distanced areas, which make the placement of a transport box 13 on the roller track 75 from above possible. By depositing or rolling a transport box up on the roller track 75, pre-positioning of the transport box in

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respect to the receiving table 45 has been achieved.

Because of the guide 84 for the shaft 82, the roller track

75 can be raised or lowered in respect to the receiving table 45. In the raised position (Fig. 1), a transport box 13 is placed on the roller track 75 or moved away from it or lifted off. In the lowered position (Fig. 3), fixation pins 87 provided on the receiving table 45 and arranged at a distance from each other engage corresponding blind receiver bores 88 on the underside of the transport box 13, so that the exact positioning of the transport box 13 on the receiving table 45 is achieved. In the exemplary embodiment represented, there are three fixation pins 87 arranged in a triangle, for example.

The two roller strips 77 of the roller track 75 are provided with a slight descending slope in such a way that an inclination in respect to the docking or loading level 89 is

achieved, wherein one or both roller strips 77 are provided with a stop 90 on this end.

Fig. 5 shows the locking mechanism for or of the cover 49 with the transport box 13. Two spaced apart T-shaped keys 91 are pivotably maintained on respective stationary shafts 92. They are driven by a gear motor 93, which is connected with a worm wheel 96 via a coupling 94 and a worm shaft 95. A clutch disk 97 is frictionally connected with the worm wheel 96 and is connected, fixed against relative rotation, with a first crank lever 98, which is connected via a hinged rod 99 with a second crank lever 98'. A parallelogram gear is achieved in this way. The movement of the hinged rod 99 is limited by stops 100 and 100', which are equipped with limit switches. The hinged rod 99 has a lever shoulder 101 approximately at the center, which is laterally conducted toward the outside of the cover 49 and which, in case of the loss of the motor drive, makes it possible to perform or finish the opening or closing process manually against the frictional resistance of the blocked gear and the natural opening or closing force. The shoulder 101 is conducted through a lateral opening of the lock door 47, and it can be actuated via a bolt 102 connected with it. It can be seen that this locking mechanism is arranged inside the lock door 47, so that it is axially connected with or released from the keys 91 when the cover 49 is set down or lifted.

## Claims

1. A device (10) for loading or unloading substrates (11) into or out of a clean room (12), having a lock device (14), on which a transport box (13) can be brought for receiving the substrates (11) and which is provided with a hermetically sealable lock opening (46), and having a processing installation (16) adjoining the lock opening (46), characterized in that an adapter device (20) is arranged between the processing installation (16) and the lock device (14), on which the lock device (14) can be releasably fastened and which is held on the processing installation (16) and can be adjustably oriented in respect to it.

2. The device in accordance with claim 1, characterized in that the adapter device (20) can be adjusted in height (Z-axis) in respect to the processing installation (16), and/or can be inclined in respect to a vertical axis (X-axis) and/or a horizontal axis (Y-axis), and/or is displaceable in one or both axes (X, Y).

3. The device in accordance with claim 1 or 2, characterized in that on its underside the adapter device (20) is connected with two spaced apart, height-adjustable forcing screws (27), which are held on a stationary element (26).

4. The device in accordance with at least one of the previous claims, characterized in that facing the processing installation (16), the adapter device (20) is provided with adjustable forcing screws (29), which are supported on a component

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of the processing installation (16).



5. The device in accordance with claims 3 and 4, characterized in that by means of the forcing screws (27) the adapter device (20) is seated, displaceable longitudinally and/or transversely, on the element (26).

6. The device in accordance with at least one of the preceding claims, characterized in that the adapter device (20) can be fixed in place on the processing device (16) by means of fastening screws (35), which pass through bores (41) of larger diameter.

7. The device in accordance with at least one of the preceding claims, characterized in that the adapter device (20) is provided with spaced apart indexing pins (32), which can be fittingly and essentially free of play plugged into receiving bores (41) of the lock device (14).

8. The device in accordance with claim 7, characterized in that every lock device (14) has a base plate (40), which has a bore pattern corresponding to the arrangement of the indexing pins (32) in the adapter device (20).

9. A device, wherein the lock device (14) has a displaceable receiving table (45) for the transport box (13), in accordance with at least one of the preceding claims, characterized in that the lock device (14) has a roller track (75) in the area of the receiving table (45).

10. The device in accordance with claim 9, characterized in that the roller track (75) can be pivoted by preferably  $\pm 90^\circ$

[illegible][illegible][illegible]

11. The device in accordance with claim 9 or 10, characterized in that the roller track (75) is provided with vertically upward extending lateral insertion slopes (86).

12. The device in accordance with at least one of claims 9 to 11, characterized in that the roller track (75) is slightly inclined in the direction toward the processing installation (16) or toward a loading and unloading level (89) and has a stop (90).

13. The device in accordance with at least one of claims 9 to 12, characterized in that the roller track (75) is formed by two parallel track element (77), which extend on both sides of the receiving table (45) and which are connected by means of a hoop (79).

14. The device in accordance with claims 10 and 13, characterized in that the connecting hoop (78) is connected with a lever (79), whose other end is pivotably maintained on a vertical shaft (82).

15. The device in accordance with at least one of claims 9 to 14, characterized in that the roller track (75) can be raised and lowered in respect to the surface of the receiving table (45).

16. The device in accordance with claims 14 and 15, characterized in that the lever (79) or the pivot shaft (82) are displaceable in height.

17. A device, wherein the lock opening (46) of the lock device (14) can be hermetically sealed by means of a lock door

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(47), which can be connected with a cover (49) of the transport box (13), in accordance with at least one of the preceding claims,

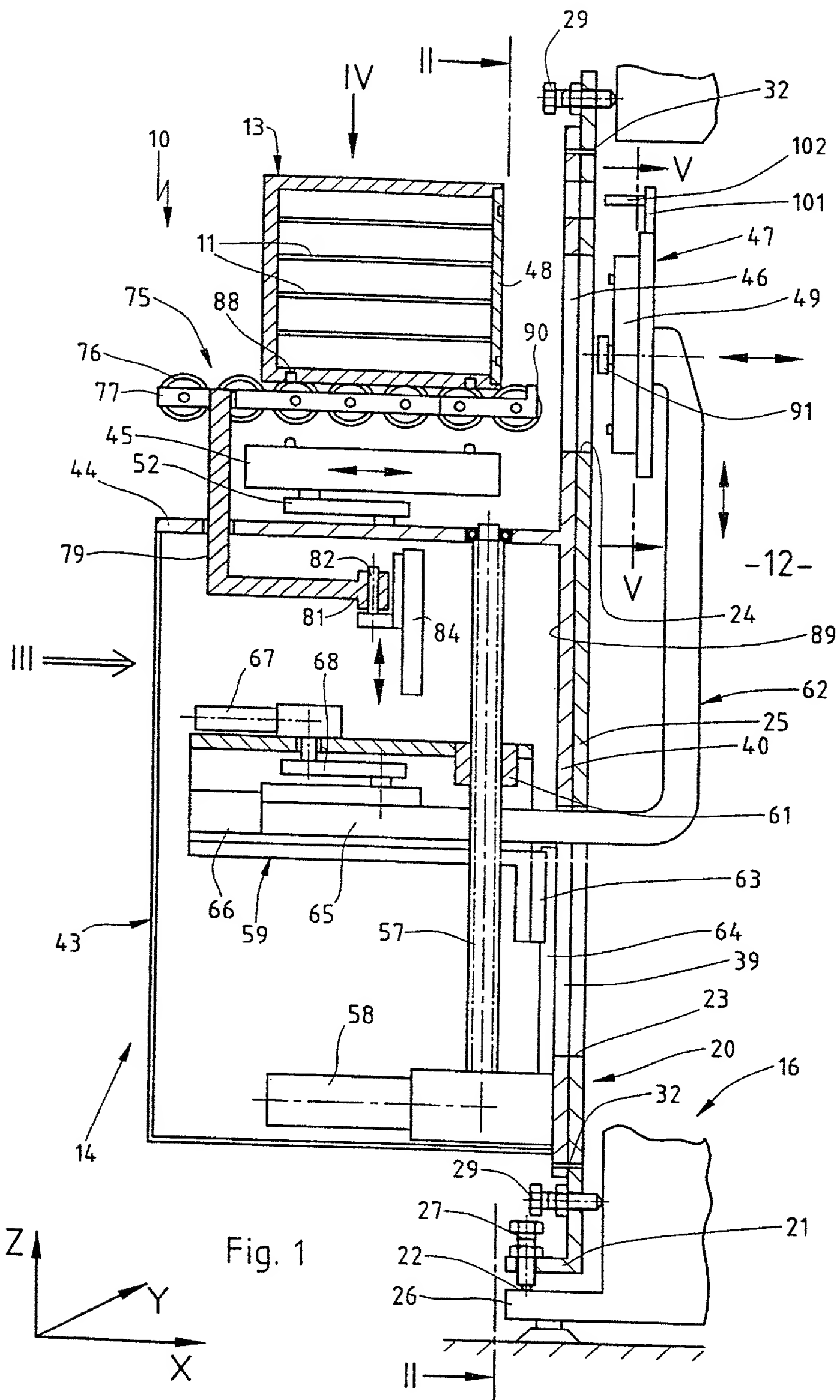
characterized in that the cover (49) is provided with two T-shaped keys, which can be rotated by means of a parallelogram drive maintained in the lock door (47).

18. The device in accordance with claim 17, characterized in that a clutch disk (97) is connected with the parallelogram drive, which is moved by a motor-driven worm gear.

19. The device in accordance with claim 17 or 18, characterized in that the parallelogram drive has a hinged connecting rod (99), from which a manual lever (101) projects, which is accessible from the outside.

20. The device in accordance with at least one of the preceding claims, characterized in that the closing movement of the lock door (47), the displacement movement of the receiving table (45) and the lowering movement of the roller track (75) are derived from a similar crank drive.

21. The device in accordance with claim 20, characterized in that the drive mechanisms for the closing movement of the lock door (47), for the displacement movement of the receiving table (45) and the lowering movement of the roller track (75) and the lock door (47) are arranged inside the lock device (14).



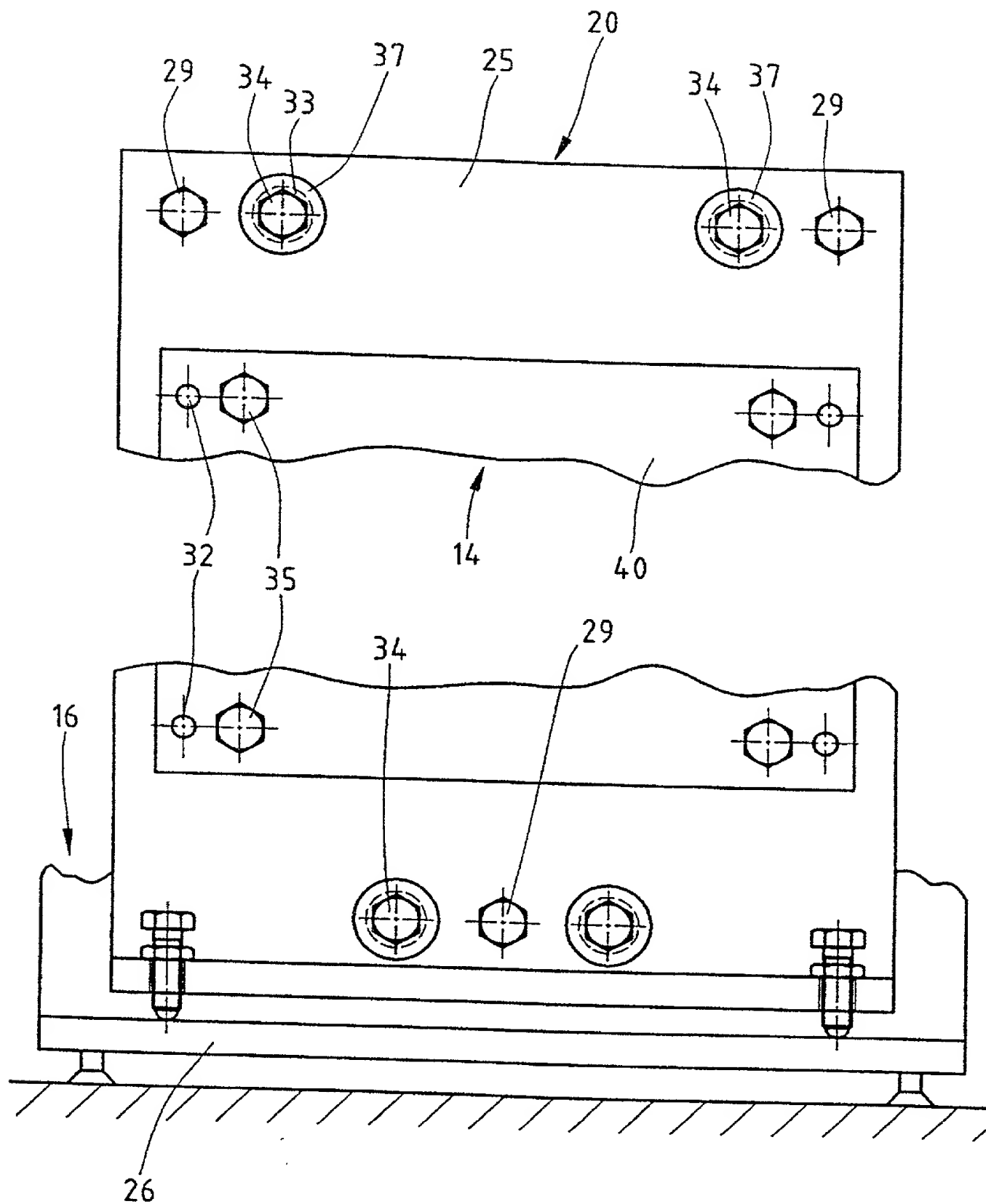


Fig. 2





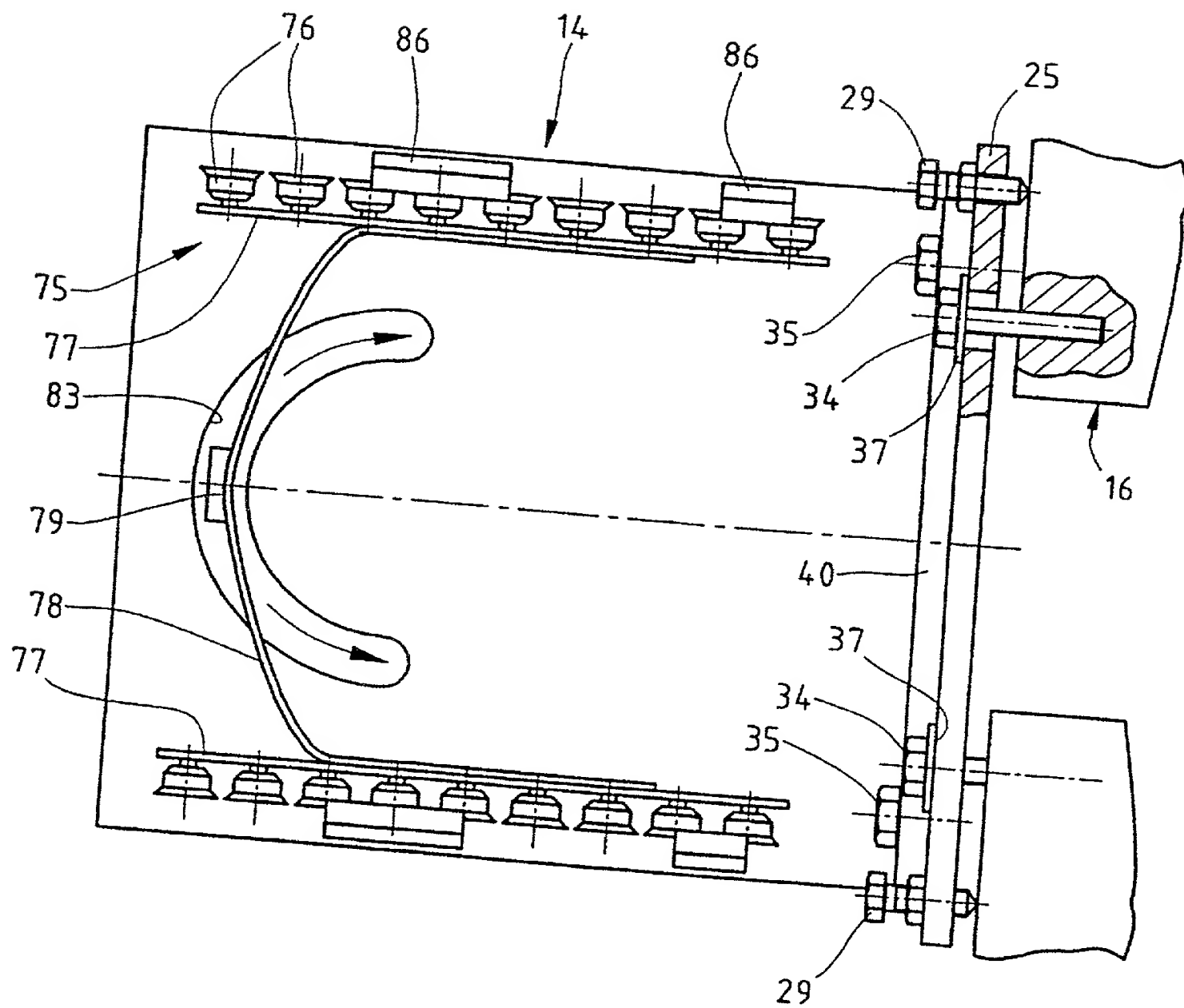


Fig. 4

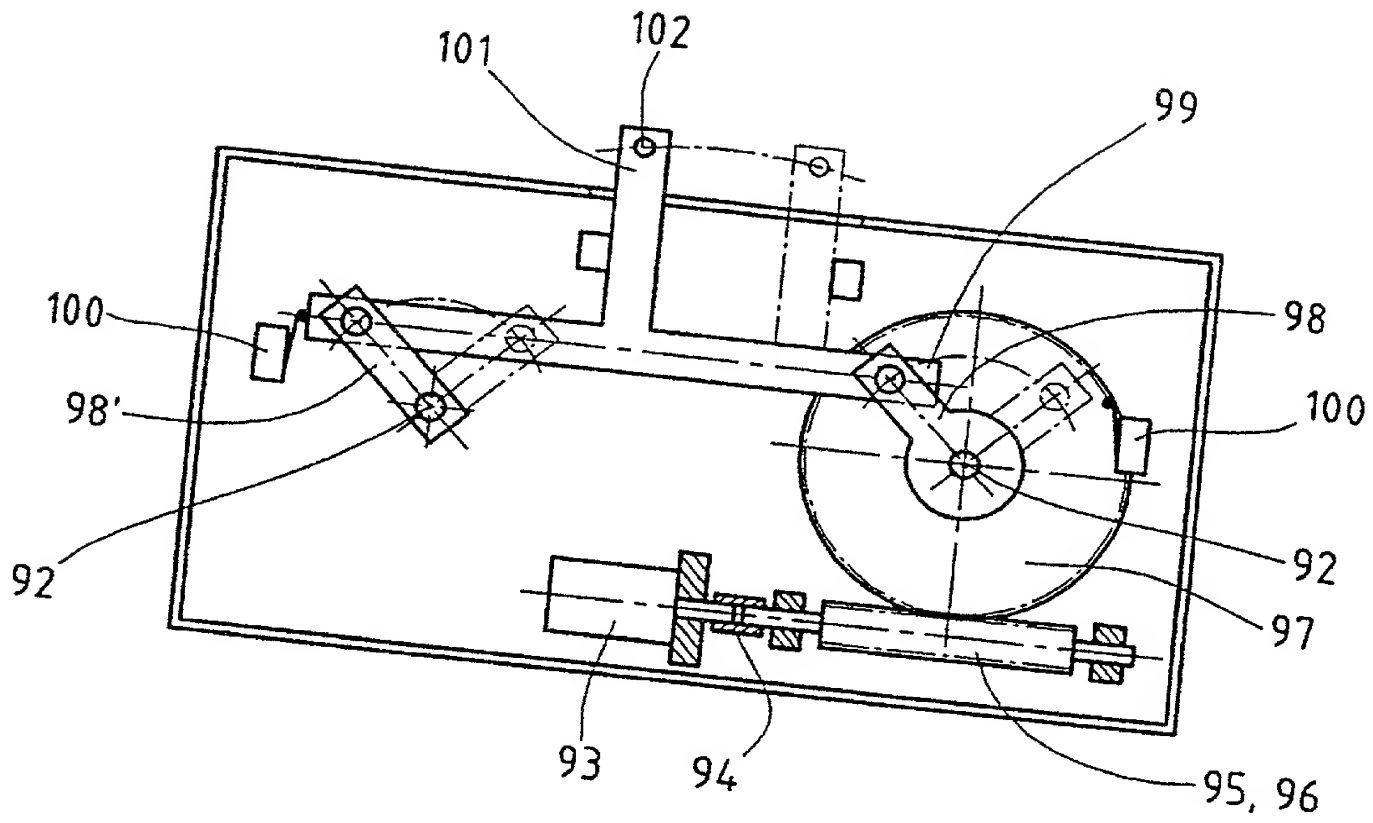


Fig. 5

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**COMBINED DECLARATION AND POWER OF ATTORNEY**

As a below named inventor, I hereby declare that:

This declaration is of the following type:

- ☐ original
- ☐ design
- ☐ supplemental
- ☒ national stage of PCT
- ☐ divisional
- ☐ continuation
- ☐ continuation-in-part (CIP)

My residence, post office address and citizenship are as stated next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed for and for which a patent is sought on the invention entitled:

**DEVICE FOR LOADING SUBSTRATES INTO AND UNLOADING THEM FROM A CLEAN ROOM**

the specification of which

☒ is attached hereto

☐ was filed on \_\_\_\_\_, as

Application No. \_\_\_\_\_

and was amended on \_\_\_\_\_

(if applicable)

☒ was described and claimed in PCT International application

No. PCT/EP99/00883 filed on 11 February 1998

and as amended under PCT Article 19 on \_\_\_\_\_

(if any).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any Amendment referred to above.

I acknowledge duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Sec. 1.56.

☒ In compliance with this duty there is attached an information disclosure statement. 37 CFR 1.97.

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I hereby claim foreign priority benefits under Title 35, United States Code, Sec. 119, of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

☐ no such applications have been filed  
☒ such applications have been filed as follows.

**Prior Foreign Application(s)**

<u>198 05 624.9</u> (Number)	<u>Germany</u> (Country)	<u>12/Feb./1998</u> (D/M/Y filed)	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<u>                    </u> (Number)	<u>                    </u> (Country)	<u>                    </u> (D/M/Y filed)	<input type="checkbox"/> Yes	<input type="checkbox"/> No

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below:

<u>                    </u> (Appl. Serial No.)	<u>                    </u> (Filing Date)	<u>                    </u> (patented, pending, abandoned)
<u>                    </u> (Appl. Serial No.)	<u>                    </u> (Filing Date)	<u>                    </u> (patented, pending, abandoned)

I hereby claim the benefit under Title 35, United States Code, Sec. 120 of any United States application(s) listed below, and insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Sec. 112, I acknowledge the duty to disclose all information known to be material to patentability as defined in Title 37, Code of Federal Regulations, Sec. 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

**POWER OF ATTORNEY:** As a named inventor, I hereby appoint the following attorney(s) and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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I hereby declare all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor Wolfgang SCHMUTZ

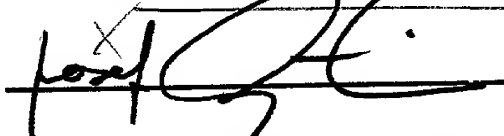
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Inventor's signature  Date X 31.07.2000

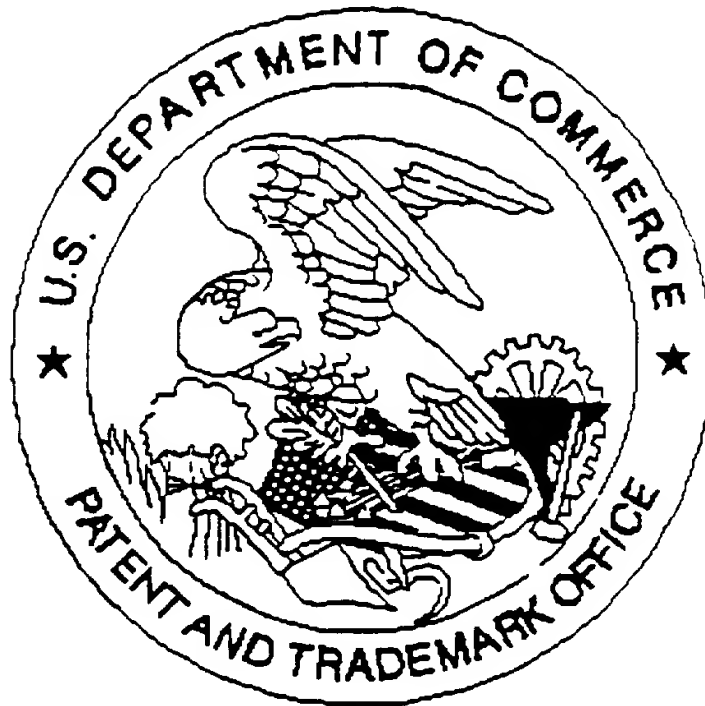
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